

Applicants: Carns et al.
Serial No.: 09/351,544
Filing Date: July 12, 1999
Docket No.: ZIL-204

REMARKS

Reconsideration and allowance is respectfully requested.

The Examiner is thanked for his time extended to Applicants and the undersigned in the telephonic interview of October 16, 2003. The undersigned is the new attorney of record and the interview was helpful in confirming the status of the case, as well as the Examiner's thinking on various matters in the exceedingly thick file wrapper. The interview helped the undersigned to prepare this amendment and to put the claims into a condition for resolution.

Before entry of this amendment, claims 3-11, 26-30, 36-39, and 72-101 were pending. In the Office Action, all claims (claims 3-11, 26-30, 36-39 and 72-101) were rejected. In the present amendment, claims 26-35 and 78-101 are canceled, and new claims 102-114 are added. After entry of the amendment, claims 3-11, 36-39, 72-74 and 102-114 are pending.

I. Claims 3, 8-11, 36, 39 and 74

Claims 3, 8-11, 36, 39 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi (USP 5,683,931), in view of Bencher et al. ("Dielectric Antireflective coatings for DUV Lithography," Solid State Technology, March 1997, Bencher, 5 pages as provided by the Examiner dated in the bottom right corner Aug. 30, 2002) (Office Action, p. 5, lines 1-4).

A. Independent claim 3 and dependent claims 8-11 and 74

1. Neither of the two cited references discloses one of the claim elements

Independent claim 3 has been amended to recite "*forming an upper electrode with a lateral boundary, wherein a portion of said dielectric layer is disposed in an inter-electrode region, said inter-electrode region disposed within said lateral boundary of said upper electrode and between said lower electrode layer and said upper electrode*" (emphasis added). In addition, claim 3 has been

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amended to recite "forming a conformal insulating layer . . . , whereby a portion of *said conformal insulating layer is formed in said inter-electrode region*" (emphasis added).

Takahashi does not disclose forming a portion of a conformal insulating layer in an inter-electrode region that is within the lateral boundary of an upper electrode. Similarly, Bencher does not disclose forming a portion of a conformal insulating layer in an inter-electrode region that is within the lateral boundary of an upper electrode. Therefore, no combination of Takahashi and Bencher could have resulted in Applicants' invention of claim 3.

Withdrawal of the §103 rejection in view of the amendment to claim 3 is respectfully requested.

2. The rejection is really a §103 rejection based on three references

The Office Action represents that the §103 rejection is based on just two references, Takahashi and Bencher. This is not the case. The cited motivation or suggestion to combine pointed to by the Examiner does not come from either Takahashi or Bencher. Rather, the alleged motivation to combine comes from a passage in Applicants' specification that the Examiner labels as "Applicant's admitted prior art (AAPA)". The Office Action states:

"It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the antireflective layer of Bencher subsequent to forming the conformal insulating layer and before forming the photolithographic mask in the method of Takahashi in order to improve the photolithographic process by reducing net linewidth variations **as stated by the Applicant's admitted prior art (AAPA)** on page 1, lines 14-15 of the originally filed specification." (Office Action, p. 6, lines 1-6)(emphasis added)

Accordingly, if the §103 rejection is sustained, it is respectfully requested that the §103 rejection be correctly stated as a three-way combination. The §103 rejection is not, as the first line of the rejection would imply, just based on the Takahashi and Bencher references.

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3. No Motivation Of Suggestion To Combine

Just because two references could hypothetically be combined to solve a first problem recognized in the prior art does not mean that the combination of the two references to solve a different problem would have been obvious. If the Examiner is aware of any controlling authority to the contrary, the Examiner is requested to identify that authority. It is not pertinent whether the combination also has the attribute of solving another problem not confronted by the inventors. There still must be evidence that a skilled artisan, confronted with the same problem as the inventors and with no knowledge of the claimed invention, would select the elements of Takahashi and Bencher for combination in the manner claimed. Recognition of the problem confronting the inventors is part of the §103 inquiry.

In the present rejection, the Examiner has improperly based a §103 rejection on a motivation to solve a different problem. The Examiner states in pertinent part:

"It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the antireflective layer of Bencher subsequent to forming the conformal insulating layer and before forming the photolithographic mask in the method of Takahashi in order **to improve the photolithographic process by reducing net linewidth variations** as stated by the Applicant's admitted prior art (AAPA) on page 1, lines 14-15 of the originally filed specification." (Office Action, p. 6, lines 1-6)(emphasis added)

First, this is not the problem confronted by the inventors. It is not pertinent whether Applicants' invention also has the attribute of reducing linewidth variations, for that is not the problem being addressed by the inventors. The claimed invention is directed to reducing capacitor leakage current through an anti-reflective layer (ARL)¹. Takahashi, in view of Bencher, does not suggest combining the claimed elements as a solution to the problem of current that leaks through an anti-reflective layer from one capacitor plate to another.

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Second, even if it is assumed that a person skilled in the art had identified the problem solved by the invention, that skilled artisan would still not have been motivated to combine Takahashi and Bencher to solve the identified problem. One of ordinary skill in the art would not have been inclined to use the teaching of Bencher (which discloses an anti-reflective layer) to solve the identified problem because the identified problem does not occur unless an anti-reflective layer is used. There is no antireflective layer used in Takahashi, so the identified problem due to an antireflective layer would not have presented itself.

The §103 rejection of Claim 3 (and its dependent claims 8-11 and 74) is therefore improper under the law. Reconsideration and withdrawal of the rejection is requested. Applicants therefore respectfully submit that claim 3 is allowable.

B. Independent claim 36 and dependent claim 39

1. Neither of the two cited references discloses one of the claim elements

Independent claim 36 is amended to recite “wherein *a portion of said conformal insulating layer is formed in an inter-electrode region within said lateral boundary of said top electrode* and between said top electrode and said conductive layer” (emphasis added). Takahashi does not disclose forming a portion of a conformal insulating layer in an inter-electrode region that is within the lateral boundary of an upper electrode. Similarly, Bencher does not disclose forming a portion of a conformal insulating layer in an inter-electrode region that is within the lateral boundary of an upper electrode. Therefore, no combination of Takahashi and Bencher can result in Applicants’ invention of claim 36.

¹ “It is this combination of the dielectric removal with the application of an anti-reflective layer having poor insulation properties that is detrimental to the capacitors” (Application 09/351,544, p. 4, lines 22-24).

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2. No Motivation or Suggestion To Combine

The Examiner makes the same basic argument with respect to claim 36 that he does with respect to claim 3 above. The Examiner states:

"It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the antireflective layer of Bencher on the structure resultant from the forming the conformal insulating layer and before forming the patterned mask in the method of Takahashi in order to improve the photolithographic process by reducing net linewidth variations as stated by the Applicant's admitted prior art (AAPA) on page 1, lines 14-15 of the originally filed specification." (Office Action, p. 7, lines 6-12)

Accordingly, Applicants' response is, first, the problem identified by the Examiner is not the problem confronted by the inventors. Just because two references could hypothetically be combined to solve a first problem recognized in the prior art does not mean that the combination of the two references to solve a different problem would have been obvious. It is not pertinent whether Applicants' invention also has the attribute of solving a different problem. Rather, there still must be evidence that a skilled artisan, confronted with the same problem as the inventors and with no knowledge of the claimed invention, would select the elements of Takahashi and Bencher for combination in the manner claimed. The motivation pointed to by the Examiner is inadequate to support a prima facie §103 rejection.

Second, even if it is assumed that a person skilled in the art had identified the problem solved by the invention, that skilled artisan would still not have been motivated to combine Takahashi and Bencher to obtain Applicants' invention of claim 36. If one of ordinary skill in the art had been given the Takahashi reference, that person would not have been inclined to use the teaching of Bencher to solve the identified problem of current leaking through an anti-reflective layer because Takahashi does not involve an antireflective layer.

Claim 36 and dependent claim 39 are therefore not obvious under 35 U.S.C. §103 in view of the cited references.

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II. Dependent claims 4-7

Dependent claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi and Bencher, in further view of Wang et al. (USP 5,545,585). (Office Action, p.12, lines 1-2) The Examiner cites Wang as disclosing “. . . a conformal insulating layer (42) that has a thickness of 45 Å” (Office Action, p.13, lines 6-7).

Claim 4 is rewritten in dependent form and now depends on claim 3. Claims 5-7 depend directly or indirectly from claim 3. Dependent claims 4-7 are therefore allowable for at least the same reasons for which claim 3 is allowable.

III. Dependent claims 37-38

Claims 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi in view of Bencher and Wang. (Office Action, p.19, lines 1-3) Claims 37-38 depend directly or indirectly from claim 36. Claims 37-38 are therefore allowable for at least the same reasons for which claim 36 is allowable.

IV. Dependent claims 72-73

Dependent claims 72-73 are rejected under 35 U.S.C. 103(a) as being unpatentable over a three-way combination of Takahashi, Bencher, and what the Examiner labels as admitted prior art (AAPA)². (Office Action, p.19, lines 14-16) Claims 72-73 depend directly or indirectly from claim 3. Accordingly, Applicants respectfully submit that claims 72-73 are allowable for at least the same reasons for which claim 3 is allowable.

The Office Action states:

“It would have been obvious to use the antireflective layer of the AAPA in the method of Takahashi and Bencher in order to substantially reduce standing waves as stated by the AAPA on page 1, lines 23-24, and page 2, lines 1-6.” (Office Action, p. 20, lines 2-5)(emphasis added)

² The Examiner labels page 1, lines 23-24, and page 2, lines 1-6, of the originally filed specification as Applicants' Admitted Prior Art (AAPA).

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The problem of reducing standing waves is similar to the problem of reducing linewidth variations as described above with respect to claim 3. Applicants' response to the rejection of dependent claims 72 and 73 is therefore similar to the response set forth above with respect to claim 3.

First, the problem of reducing standing waves advanced by the Examiner is not the problem of Applicants' problem of current leaking through an anti-reflective layer. Second, even if it is assumed that a person skilled in the art had identified the problem solved by the invention, that skilled artisan would still not have been motivated to combine Takahashi and Bencher. If one of ordinary skill in the art had been given the Takahashi reference, that person would not have been inclined to use the teaching of Bencher to solve the identified problem because Takahashi does not involve an antireflective layer.

Reconsideration and allowance of claims 72-73 is requested.

V. New Claims

New claim 102 recites "wherein said subsequently removing . . . is performed using isotropic wet etching".

New claim 103 recites "removing a portion of said dielectric layer such that an exposed portion of said lower electrode layer is formed and such that an undercutting is formed in said inter-electrode region underneath said edge of said upper electrode". New claims 104-106 depend from claim 103.

New claim 107 recites "removing a portion of said dielectric layer using anisotropic etching such that an undercutting is formed . . ." New claim 108 depends from claim 107.

New claim 109 recites a device having "an undercutting in said inter-electrode region, wherein said capacitor dielectric is absent from said undercutting and said undercutting is filled by said insulating material . . .". New claims 110-112 depend from claim 109.

New claim 113 recites a device having "means for preventing an electrical connection through said anti-reflective layer from said upper electrode to said

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lower electrode layer, wherein said means is at least partially disposed within said inter-electrode region". Claim 114 depends from claim 113.

These recitation in these new claims are nowhere disclosed or suggested in the cited references. Consideration and allowance of the new claims is requested.

VI. Conclusion


In view of the foregoing amendments and remarks, Applicants respectfully submit that the entire application (Claims 3-11, 36-39, 72-74 and 102-114 are pending) is in condition for allowance. Applicants respectfully request that a timely Notice of Allowance be issued in this case. If the Examiner would like to discuss any aspect of this application, the Examiner is requested to contact the undersigned at (925) 621-2121.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Mail Stop Non-Fee Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

By 
Darien K. Wallace

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Respectfully submitted,


Darien K. Wallace
Attorney for Applicants
Reg. No. 53,736